



Plant-food preparation on two consecutive floors at Upper Paleolithic Ohalo II, Israel



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ABSTRACT

The Ohalo II Upper Paleolithic site was inundated for ca. 23,000 years. A unique and diverse assemblage of seeds and fruit was thus excellently preserved on its brush huts floors. Three successive floors were identified in Brush Hut 1; about 55,000 seeds and fruits were found on its lower floor, Floor III. Food preparation features were found on two of these floors: a hearth in the center of Floor III and a grinding stone in the north of Floor II. Here we analyze the spatial distribution of fourteen prominent plant taxa recovered from Floor III, and compare the results with previously published spatial distribution of the same taxa on Floor II. We describe here the plant remains' distribution around food preparation features – grinding stone (floor II) and a central hearth (floor III), and the groups of taxa which appear on both floors. The similarity in taxa as well as their concentrations on both floors indicates similar activities. We also raise the possibility that the two floors represent two different seasons of occupation – Floor III in winter and Floor II in summer.

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1. Introduction

The lifestyles of ancient societies can be reconstructed by a multi-disciplinary approach combining, for example, the analysis of tools, animal bones, and plant remains. However, knowledge of the site's structure and its preservation following abandonment is essential for this task. The remains' spatial distributions may reflect how a society functioned, in particular activity areas (Balme and Beck, 2002; Hayden, 1997), but only when they are found in situ (Goldberg, 2000; Goldberg and Bar-Yosef, 1998). Charred plant remains such as seeds are usually light and vulnerable to a wide variety of depositional and post-depositional processes. Only in rare cases were the remains preserved in situ and in large enough quantities to permit for spatial analyses (Alpers-Afil et al., 2009).

One such case is the late Upper Paleolithic site of Ohalo II, Israel (Fig. 1). This camp site was widely excavated and the main elements include six brush huts, several open-air hearth concentrations, and a grave. The brush hut floors were dug into the Lisan Formation, on the shore of a fluctuating lake. The site was radiocarbon dated to 22,500–23,500 cal B.P. (Nadel et al., 1995, 2002).

Brush Hut 1, the largest and best preserved hut, had three successive floors (Fig. 2). The upper floor was only partially preserved, but Floors II and III were discovered intact. Floors II and III were covered by sediments after its use, which sealed them from disturbance (Nadel et al., 1995, 2002).

Weiss et al. (2008) found that food preparation on Floor II of Brush Hut 1 was concentrated on its northern side. This was indicated by the presence of a grinding stone set firmly on its floor, with cereal seeds forming a distinct non-random pattern around it. Cereal starch grains were retrieved from the upper face of the stone but were rare on the lower face and the adjacent sediments, indicating that it was used for cereal seed grinding (Piperno et al., 2004; Nadel et al., 2012).

Our previous report (Weiss et al., 2008) describes and interprets the distribution of almost 60,000 identified seeds and other plant remains on Floor II's 12 m². The study reconstructed three activity areas in the hut's interior: a food and possibly medicinal plant processing area centered around a grinding stone in the north; a flint knapping locale in the south; and an access area between the two (Piperno et al., 2004; Nadel et al., 2012). Floor III, located below Floor II, is the earliest of the three floors. This floor is covered by a grass bedding containing bunches of partially charred *Puccinellia* cf. *convoluta* stems and leaves (Fig. 3), which were arranged around the central hearth (Nadel et al., 2004). Most of the plant remains of Floor III were found in the sediment above the grass bedding.

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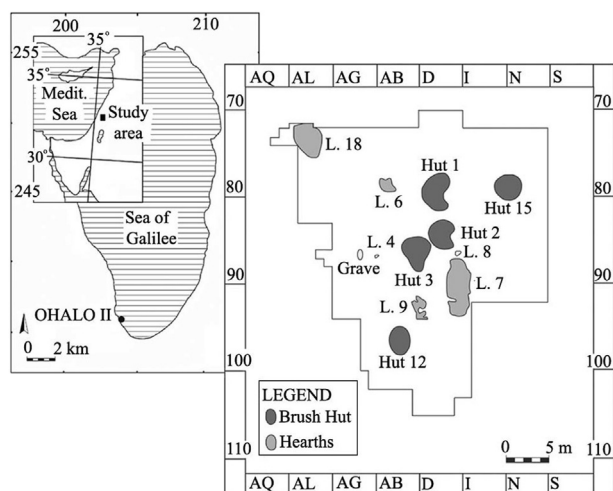


Fig. 1. Location map of Ohalo II and central area of excavation at the site.

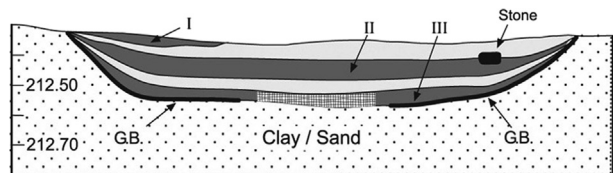


Fig. 2. A north-south cross-section through the floors of brush hut 1. Note the exaggerated vertical scale. I, II, III, indicate the three floors, the grinding stone on right is discussed in text; GB = grass bedding.

This work presents the spatial distribution of 45,606 charred seeds and fruits on Floor III out of a total of 55,000 that were found on it, as well as comparing this to the 52,323 out of 57,811 plant remains found on Floor II (taxa without adequate number of finds across the entire floor area were omitted, see below). These finds illuminate the differences between the two phases of floor use and food preparation. The new results indicate that Floor II users were

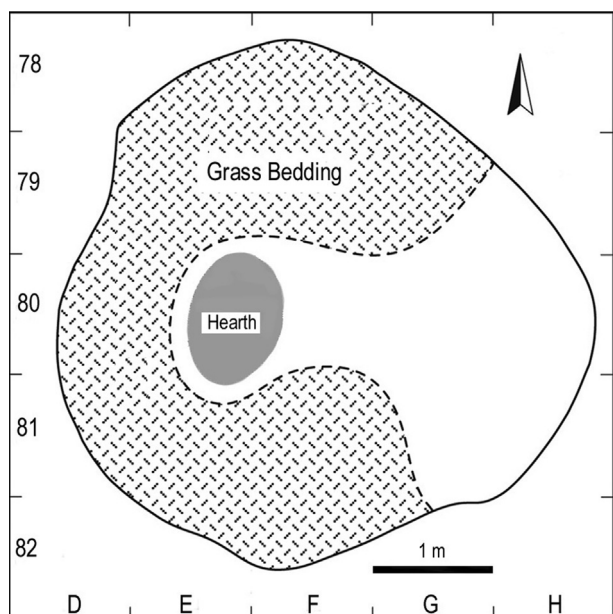


Fig. 3. Floor III, the hearth in the center and the grass bedding around it.

Floors' overlap

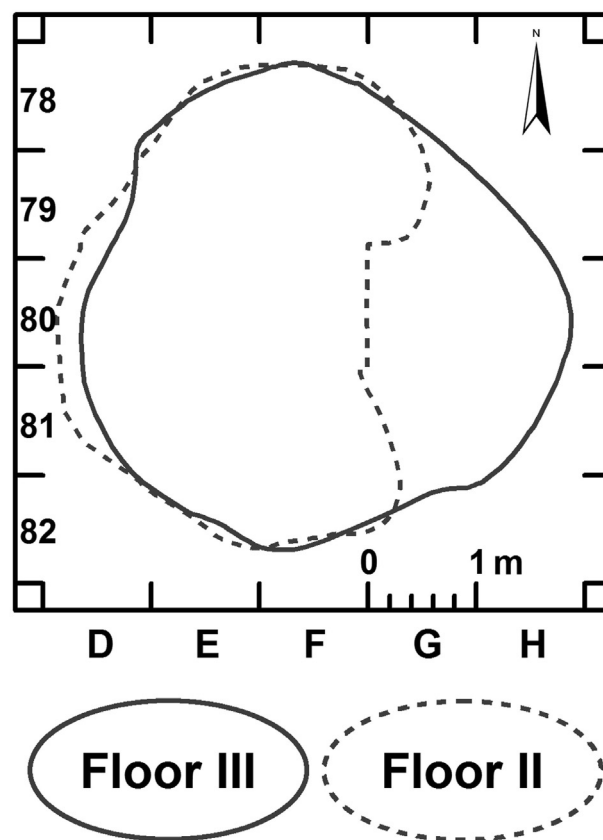


Fig. 4. Outlines of the two overlapping floors, Floor II is above Floor III.

fully aware of the location of the earlier hut over Floor III (Fig. 4). In addition, we found several correlations between the plant distribution mappings of the two floors. We will discuss these results below.

2. Materials and methods

2.1. The site of Ohalo II

Ohalo II is located on the southwestern shore of the Sea of Galilee, Israel. The site was inhabited and then inundated ~23,000 years ago, during the Last Glacial Maximum (LGM) (Nadel et al., 2004). It was discovered in 1989 when the lake water level dropped drastically to ~213.8 m below mean sea level (MSL) following several years of drought and water pumping. The submerged site is exceptionally well-preserved. The remains of six brush huts were identified during fieldwork, in addition to several hearths concentrated around them (Fig. 1). Four of the brush huts were fully excavated and two were largely sampled. All of these huts had a bowl-like cross section, indicating that the inhabitants made shallow depressions in the soft bedrock before their construction. Four huts were oval in general shape, while two were kidney-shaped.

The plant species used for hut construction were identified as the following species. Brush Hut 1, the largest hut, was made from thick branches of *Tamarix* (tamarisk), *Salix* (willow) and *Quercus ithaburensis* (oak), covered by smaller branches of species such as *Atriplex/Seidlitzia* (orach/seidlitzia) and *Prosopis* (mesquite), as well

as by leaves and grasses. At this point, a particularly rich plant assemblage of ca. 150,000 seeds and fruits has been studied (Piperno et al., 2004; Nadel et al., 2004, 2012; Weiss et al., 2005). In addition, a wide variety of in situ remains such as flint and ground stone tools, faunal remains (fish, mammals, birds, rodents, reptiles and mollusks), beads, bone, and wood objects were found on the floors. Several hearths and a grave were also uncovered nearby (Nadel et al., 1994, 2004; Simmons and Nadel, 1998; Bar-Yosef Mayer, 2002; Belmaker, 2002; Hershkovitz et al., 1993, 1995; Kislev et al., 1992; Nadel, 2002; Nadel and Hershkovitz, 1991; Rabinovich and Nadel, 1994–5, Zohar, 2002; Zohar et al., 2008).

The outstanding preservation has been discussed in several publications, which suggest that the rise of the lake level immediately after hut abandonment sealed the site (Nadel et al., 1995, 2002, 2004; Nadel, 2002). Unlike other remains, the plant material was initially protected by fire charring. This combination of charring, low-oxygen conditions under the lake water, and sealing by sedimentation created an ideal setting for preservation of the organic material (Nadel et al., 2012; Weiss, 2002).

Tsatskin and Nadel (2003) reconstructed the site formation history and were able to distinguish anthropogenic features from natural deposits. They confirmed the presence of three successive floors in Brush Hut 1, which establishes that the dark organic layers are human-made floors rather than the products of natural forces (see Figs. 2 and 3). The quantities and distribution pattern of finds in general and plant remains in particular on two of these floors are distinct and show several non-random patterns.

The distribution of the charred plant remains on these floors, as this paper and the previous one (Weiss et al., 2008) show, is far from being sporadic. It is our belief that there was no accumulation of water in the huts after they were burned. A certain pattern of distribution of plants is expected when water floods the hut after a fire, since it will carry the different grains according to their physical characters (density) and shape (Sobolik, 2003). In such a case, it would be expected that the larger grains will be concentrated at the lowest point on the floor, which is the hearth. Also, as will be presented here, there are distribution patterns of species and groups of species concentrated in specific locations across the floor. These patterns are not random, which would have been expected from a water-filled, bowl-shaped crater full of charred plants.

2.1.1. Analysis and mapping of Floor III

The oldest of the three superimposed floors was the focus of the current study. This floor is somewhat roundish in shape and about 4.5×5 m in size, with an area of ~ 14 m² (Fig. 3). Like the rest of the site, it was excavated in 0.5×0.5 m units. Botanical remains from this floor were sampled systematically. We analyzed all samples from the floor, which resulting in examining almost 55,000 plant remains in this study.

In order to present a meaningful distribution, we have included maps for those species that were found on both floors and show adequate number of finds across the entire floor area: >200 grass grains or >100 specimens from other families. These taxa are: *Atriplex rosea/leucoclada* (tumbling orach), *Avena barbata/sterilis* (Oat), *Bromus brachystachys* (brome), *Galium tricornutum* (corn cleavers), *Hordeum spontaneum* (barley), *Malva aegyptia/parviflora* (mallow), *Melilotus indicus* (Indian melilot), *Piptatherum holciforme* (millet grass), *Puccinellia cf. convolute*, *Silybum marianum* (holly thistle), *Suaeda palaestina/fruticosa* (sea-blite) and *Triticum dicoccoides* (wheat) (Table 1). We mapped another type of find – broken grass/cereal grains, which we tentatively termed “burgul”. Fig. 5 shows the “burgul” from the hearth (Square E80d (A)) and, for comparison, modern burgul, which is comprised of broken grains of wild *T. dicoccoides* (B). The break surfaces on both of them are

Table 1
Mapped plant remains from Floors III and II.

Figure	Find	Floor III		Floor II	
		Quantity	% Of total	Quantity	% Of total
6	Groups of species				
7	<i>Hordeum spontaneum</i> (grains)	1920	3	703	1
8	<i>Piptatherum holciforme</i> (grains)	4870	9	949	2
9	“Burgul”	730	1		
10	<i>Galium tricornutum</i> (mericarps)	5528	10	6271	11
11	<i>Silybum marianum</i> (achenes)	507	1	163	<1
12	<i>Bromus brachystachys</i> (grains)	6516	12	10,140	18
13	<i>Puccinellia cf. convoluta</i> (grains)	590	1	903	2
14	<i>Malva aegyptia/parviflora</i> (mericarps)	1830	3	822	1
15	<i>Melilotus indicus</i> (seeds)	147	<1	110	<1
16	<i>Atriplex rosea/leucoclada</i> (fruits)	463	1	1228	2
17	<i>Suaeda palaestina/fruticosa</i> (seeds)	22,505	41	31,034	54
18	All species	45,606	83	52,323	91

relatively straight, indicating that the archaeological grass grains were broken before they were charred by fire.

We assume that these broken grains represent food preparation. We then compared the relative frequencies and the spatial

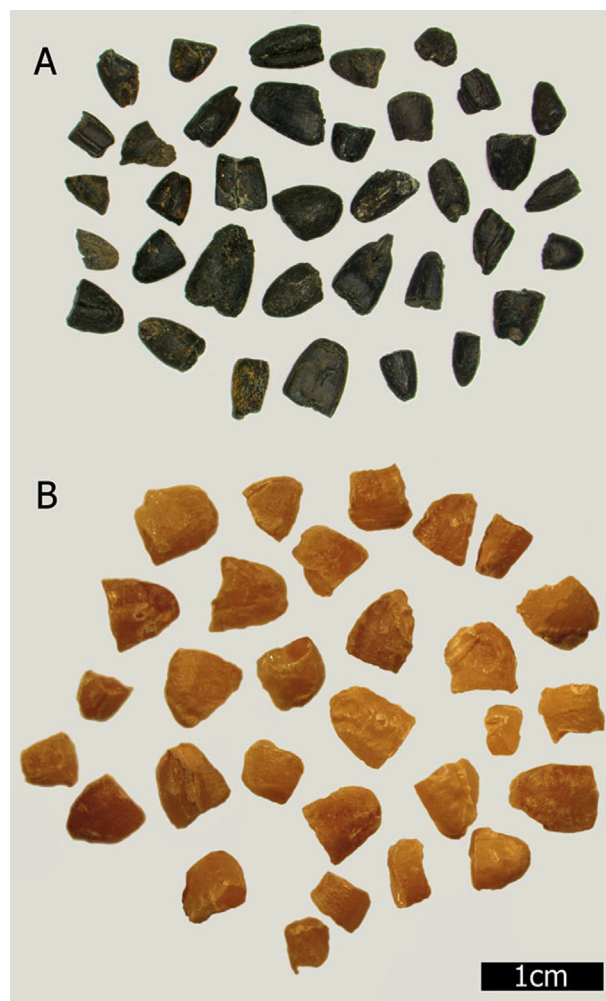


Fig. 5. Modern and archaeological “Burgul”. A. from the hearth of Floor III, square E80d. B. Wheat burgul from Jerusalem’s legendary “Mahane Yehuda” market, purchased in 1980.

distribution of plant remains on the two superimposed floors (Table 1). The mapping was carried out using ArcGIS 10 software. For each taxon, the results are presented on a grid of 0.25 m² units as a percentage of the total amount of that taxon on the whole floor.

The scale bar for each taxon gives the concentration of this taxon from 1% up to the highest percentage of concentration. The taxa which were found to represent less than 1% were painted gray.

Most concentrations stand out immediately on the distribution maps, without further treatment of the data (Figs. 6–18).

3. Results

3.1. Spatial analysis

The following analysis is based on nearly 98,000 plant remains from Hut Number 1 in Ohalo II: some 52,000 on Floor II and some 46,000 on Floor III. Table 1 gives the taxa we found to show a meaningful distribution and their relative representation throughout the floor.

According to the spatial distribution maps (Figs. 6–18), the groups of species are concentrated on Floor III in four distinct areas (Fig. 6):

A. The cereals (here also *P. holciforme*) were found in the southern part of Floor III. They include *H. spontaneum*, (Fig. 7), and *P. holciforme*, (Fig. 8). In one of the squares of the hearth (E80d) 9% of the *P. holciforme* was found, in addition to 76% of the “burgul” fractions (Fig. 9). Some of these fractions identified as

Triticum dicoccoides, *H. spontaneum*, *A. barbata/sterilis*, and *P. holciforme*.

- B. Another group is concentrated in the center of the hut, west of the hearth, together with Group A. Squares E80a and E80c contained 25% of the *G. tricornutum* (Fig. 10). *S. marianum* was found to be concentrated in the west: 14% in Square E80c, 15% in Squares E80d and E81a, and 18% in the nearby Square E79d (Fig. 11).
- C. The “small-grained grasses” (after Weiss et al., 2005) were concentrated north of the hearth, on the grass bedding. 70% of the *B. brachystachys* and some 30% of the *Puccinellia cf. convoluta* were found in adjacent Squares E79b and F79a (Figs. 12 and 13, respectively). An additional 28% of the *P. cf. convoluta* was located west of the hearth in Square E80c (Fig. 13).
- D. A fourth group is concentrated in the northern part of the hut, just north of the hearth. The species here includes *M. aegyptia/parviflora*, of which 40% of its seeds are present in Squares F79a and F79d (Fig. 14), as well as *M. indicus*, (Fig. 15) with 35% of its seeds in the same squares. With respect to *A. rosea/leuococlada*, 46% of its fruits were concentrated in E79b and F79a, another 11% concentration was found in Square E80a (Fig. 16). More than 22,500 *S. palaestina/fruticosa* seeds were found over the entire floor (Fig. 17), with the primary concentration located north of the hearth. These included 42% in Square F79a, and 10% and 9% in adjoining Squares E79b and E79d, respectively. An additional 10% was found in E80a and E80c.

3.2. Correlations between the taxa on Floor III

Two aspects of the distribution patterns are relevant here. The first is the distinct pattern of certain species. The second is the associated distributions of several species in relation to each other.

- Some 47% of the *S. marianum* achenes were found in four adjacent squares (E79d, E80c, E80d, E81a). These squares also hold a group of cereal grains: 10% of the *H. spontaneum*, and 20% of the *P. holciforme* (Figs. 7, 8 and 11).
- Several species are also concentrating just west of the hearth: *G. tricornutum* which 25% of its seeds found in two adjacent squares (E80a, E80c), and also 6% of the *H. spontaneum* and 17% of the *P. holciforme* (Figs. 7, 8 and 10).
- The most interesting finding is related to the hearth, which contained almost only cereal grains and “burgul”. The “large-grained grasses” were also common in the southern part of the hut. In contrast, the northern part of the hut contained mainly “small-grained grasses.”

3.3. Comparison between Floors III and II

Because the builders of Floors III and II constructed their huts over the same exact area (see Fig. 4), we assume that they were familiar with the remnant of the earliest hut (Floor III) while constructing the second one (Floor II). It is impossible to confirm, but our general impression is that the builders of these two huts lived within a short period of time. Keeping this in mind, we have compared the plant distributions on these floors to characterize short-term changes in living patterns of this ancient society.

Outstanding concentrations of several species and groups of species on the two floors are given addressed here.

- (i) On Floor III, 77% of the *B. brachystachys* grains were concentrated in 6% of the floor area. On Floor II, 42% of the

GROUPS OF SPECIES Floor III

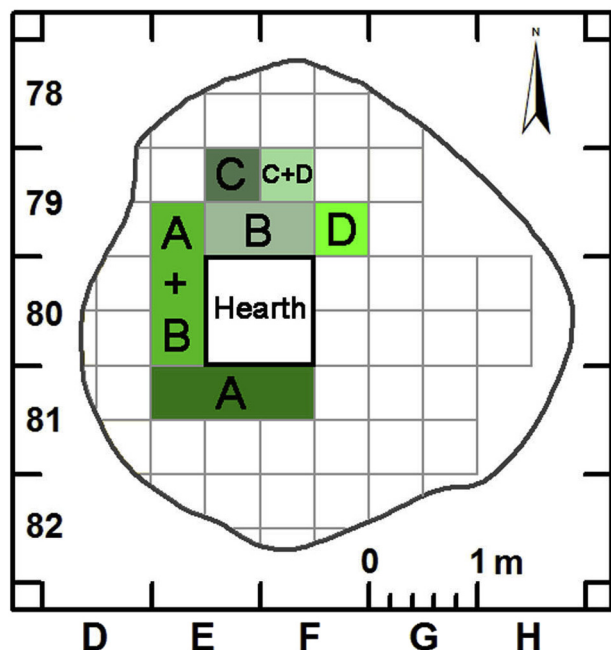


Fig. 6. Spatial distribution of four distinct groups of species on Floor III. A. Wild barley (*Hordeum spontaneum*), millet grass (*Piptatherum holciforme*) and “burgul”. B. Corn cleavers (*Galium tricornutum*) and holy thistle (*Silybum marianum*). C. “Small-grained grasses”; brome (*Bromus brachystachys*) and *Puccinellia cf. convolute*. D. Mallow (*Malva aegyptia/parviflora*), Indian melilot (*Melilotus indicus*) and orache (*Atriplex rosea/leuococlada*). The lined square shows the location of the hearth.

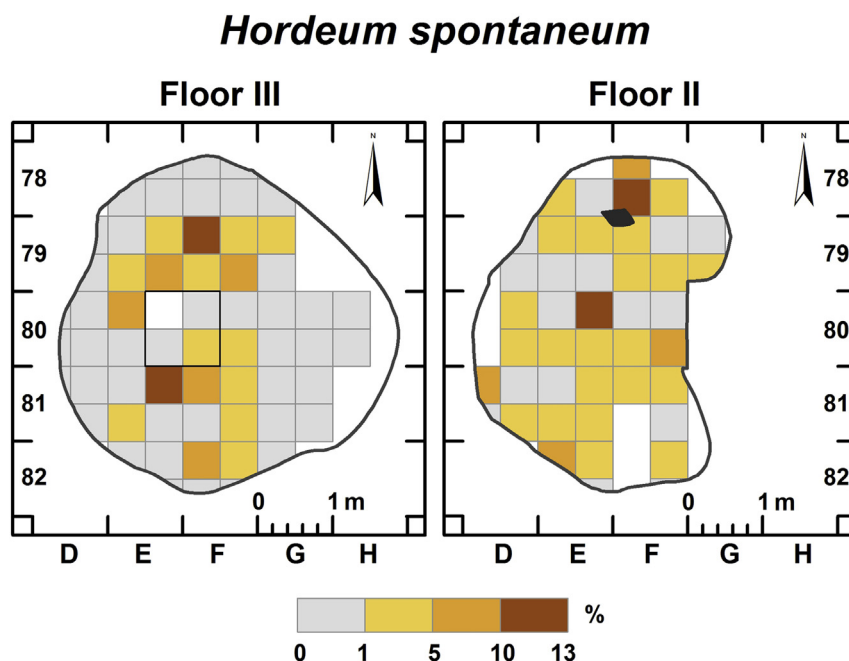


Fig. 7. Distribution of wild barley (*Hordeum spontaneum*) 1920 grains on Floor III and 703 grains on Floor II. The scale bar for each taxon give the concentration of this taxon from 0% up to the highest percentage of concentration. The taxa which were found 0–1% were painted gray. The lined square shows the location of the hearth in Floor III. The black diamond shows the location of the grinding stone in Floor II. The following distribution maps, Figs. 8–18 follow the same convention.

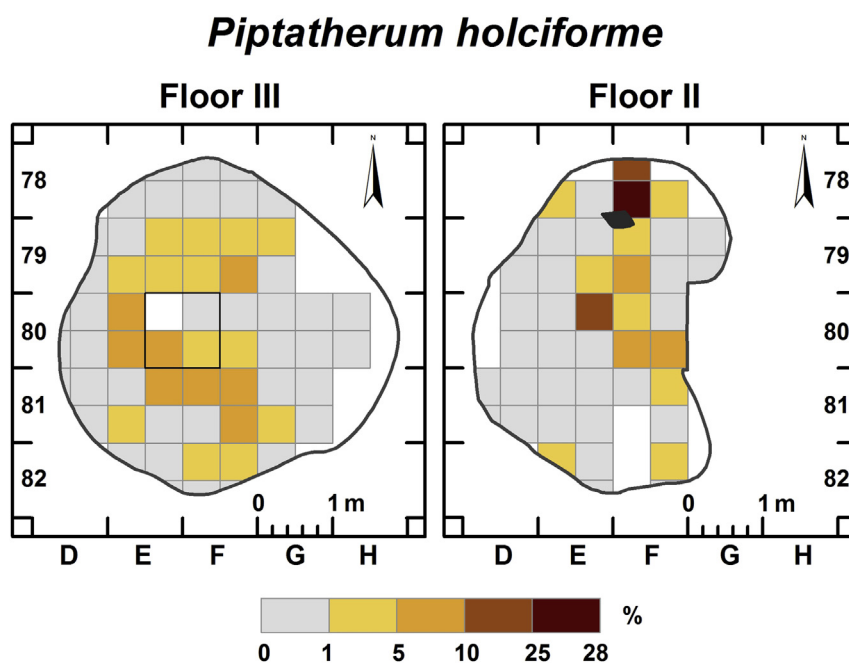


Fig. 8. Distribution of millet grass (*Piptatherum holciforme*) 4870 grains on Floor III and 949 grains on Floor II.

- B. brachystachys* grains were concentrated in 9% of the area (Fig. 12).
- (ii) On Floor III, 49% of the *H. spontaneum* grains were concentrated in 11% of the floor area and on Floor II, 32% of the grains were concentrated in 7% of the area (Fig. 7).
- (iii) On Floor III, 55% of the *P. holciforme* grains were concentrated in 13% of the area. On Floor II, 60% of the grains were concentrated in 7% of the area (Fig. 8).
- (iv) On Floor III, 45% of *M. aegyptia/parvifloras* organs were found on 6% of the floor, and on Floor II, 33% of the organs were found on 7% of the area (Fig. 14).
- (v) On Floor III, 60% of the *S. marianum* achenes occupied 11% of floor area. On Floor II, 39% of the achenes occupied 9% of floor area (Fig. 11).
- (vi) On Floor III, 57% of *A. rosea/leucoclads* fruits occupied 5% of the area, and on Floor II, 34% of it occupied 9% of the area (Fig. 16).

Burgul

Floor III

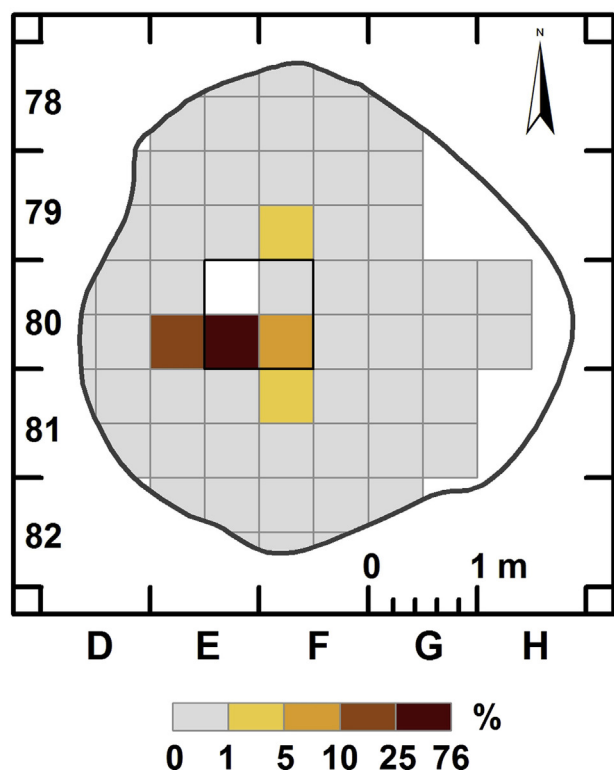


Fig. 9. Distribution of cereal fractions “burgul” 730 fractions on Floor III. Same of the fraction identified as; wild wheat (*Triticum dicoccoides*), wild barley (*Hordeum spontaneum*), wild oats (*Avena barbata/sterilis*) and millet grass (*Piptatherum holciforme*).

- (vii) On Floor III, 42% of *S. palaestina/fruticosa* were found on 2% (one square) of the area, and on Floor II, 35% of that plant's seeds were concentrated in 9% of the area (four squares) (Fig. 17).
- (viii) On Floor II, 13% of *S. marianum*, 11% of *H. spontaneum*, and 13% of the *P. holciforme* remains were distributed on one square (E80d). We find the same pattern found on Floor III (3.2 Correlations between the taxa).
- (ix) In Floor II, 33% of all plant remains are concentrated in the 8 squares around the grinding stones (E78c-d, E79a-b, F78c-d, F79a-b), while in Floor III, 53% of the total plant remains were found in the 8 squares north of the hearth (E79a-d, F79a-d) (Fig. 18).

To sum up, while comparing the distribution of plants remains on the two floors it is clear that each floor is unique in its space use. All plants which were preserved in large quantities are concentrated in different spots in each floor. This find indicate that food preparation activity was organized in designated areas, large amount of those remains found on the north part of the huts around food preparation features and the assemblage of *S. marianum*, *H. spontaneum*, and *P. holciforme* grouped together on both floors is not random.

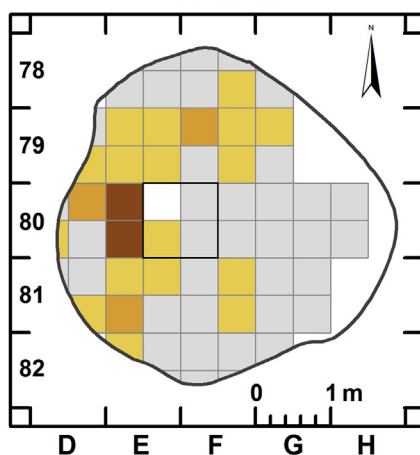
4. Discussion

Because the northern segments of both floors are at the same level as the rest of the respective floors (and not shallow depressions, Fig. 2), we cannot assign a topographical cause for the concentration of finds towards the north. This tendency seems to be related to human activity. Thus, the inhabitants of Floor II preparing food taking place in the northern part of the hut indicates that these residents, both male and female, were familiar with the sociological patterns of the earlier inhabitants of Floor III, who also used the northern part of the hut for food production.

While dealing with plant distributions, it is important to refer to the number of dispersal units per plant, and to the nutritional value or specific use of a taxon. However, since all taxa under

Galium tricornutum

Floor III



Floor II

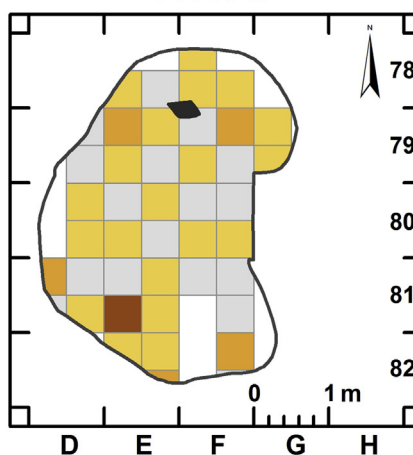


Fig. 10. Distribution of corn cleavers (*Galium tricornutum*) 5528 mericarps on Floor III and 6271 mericarps on Floor II.

Silybum marianum

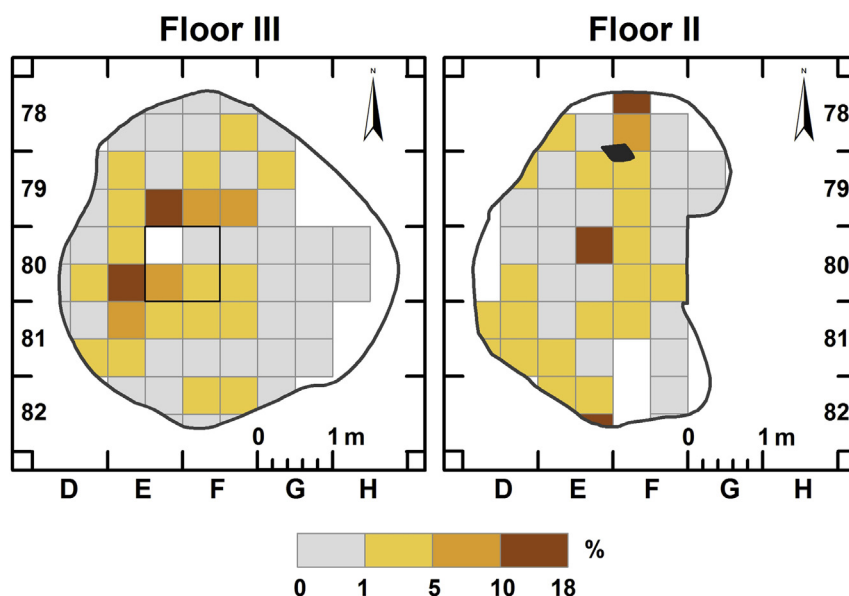


Fig. 11. Distribution of holy thistle (*Silybum marianum*) 507 achenes on Floor III and 163 achenes on Floor II.

Bromus brachystachys

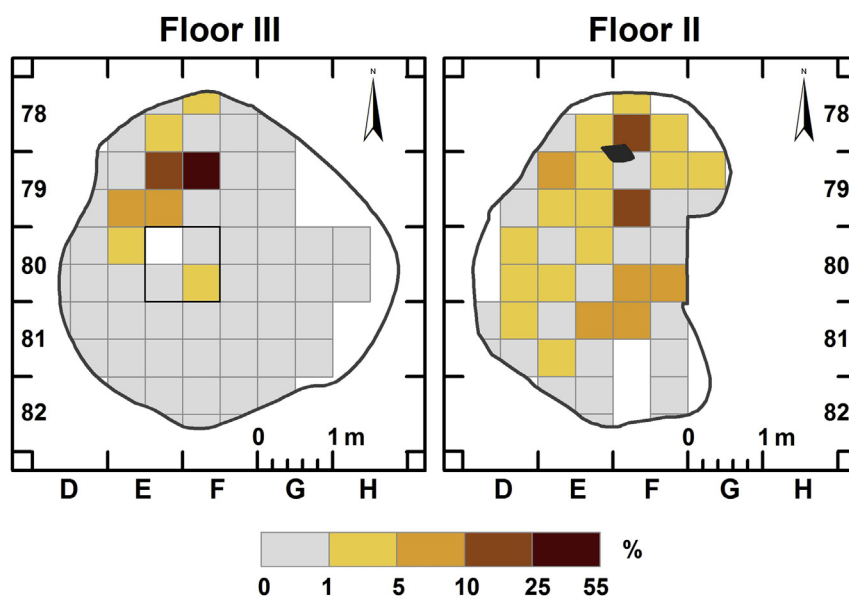


Fig. 12. Distribution of brome (*Bromus brachystachys*) 6516 grains on Floor III and 10,140 grains on Floor II.

consideration were dealt with in detail in a previous paper (Weiss et al., 2008), we do not probe these issues here.

As already described (3. Results), there are clear correlations between the locations of various plants remains and the hearth, as well as between groups of plants. Especially, there is a tendency for food-related plants to be located in the northern part of the hut (Fig. 18). Results of the spatial analyses described above can reconstruct food management strategies of the people living at the site. The concentration of the “burgul” fractions within the hearth further indicates that processing of cereals took place there, maybe even using fire to parch/cook the grains. Similarly, the absence of

“small-grained grasses” in the hearth might indicate that they were treated in a different manner in a separate locale when they were used as food. Furthermore, the distribution of *P. cf. convoluta* and *B. brachystachys* in two areas distant from the hearth may indicate locations that were used for food preparation by methods not involving fire. Regarding *P. cf. convoluta*, it should be remembered that this species was the exclusive component of grass bedding found at the bottom of Floor III (Nadel et al., 2004). It is possible that the *P. cf. convoluta* seeds found on Floor II had fallen off badly-preserved grass bedding on this floor. They may have been also used for food (Weiss et al., 2005, 2008).

Puccinellia cf. convoluta

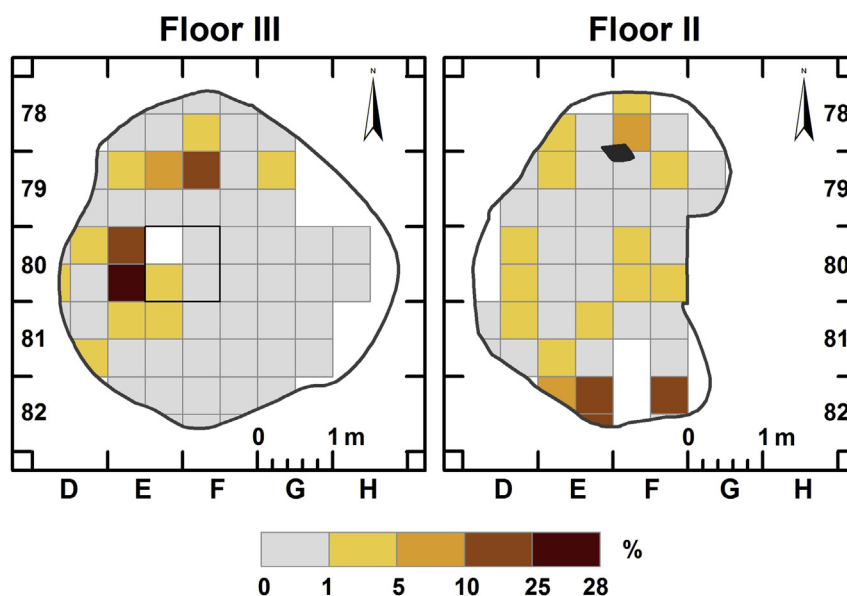


Fig. 13. Distribution of *Puccinellia cf. convoluta* 590 grains on Floor III and 903 grains on Floor II.

Malva aegyptia / *parviflora*

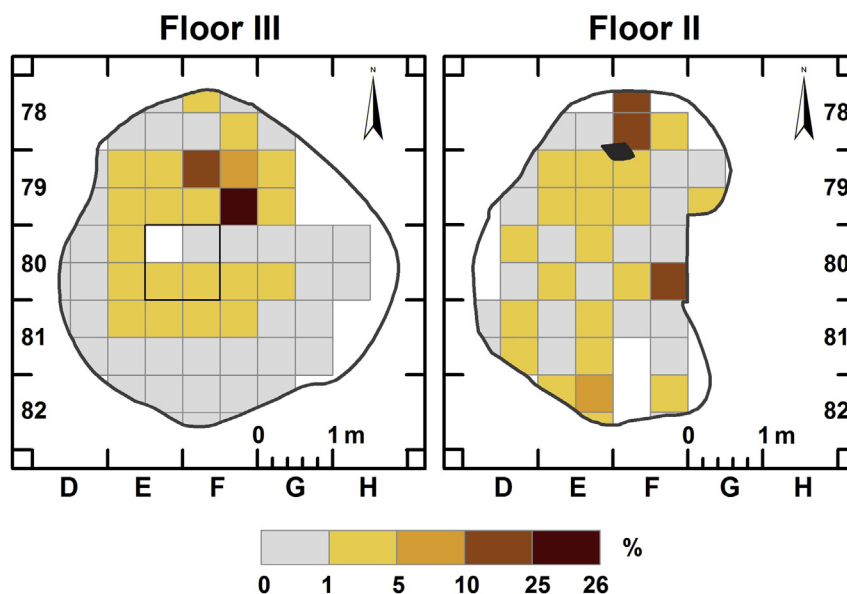


Fig. 14. Distribution of mallow (*Malva aegyptia/parviflora*) 1830 mericarps/seeds on Floor III and 822 mericarps/seeds on Floor II.

M. aegyptia/parviflora, *M. indicus* and orache *A. rosea/leucoclada* were found together in the northeastern part of Floor III, indicating that this area was used for food preparation.

The distribution map of *S. palaestina/fruticosa* shows clearly that the plant is concentrated in a single square (see above). In a previous publication (Weiss et al., 2008), we suggested this *S. palaestina/fruticosa* functioned as a roof/wall construction material. However, when we examined our data, we noticed that this taxon is concentrated in just two spots on Floor II – some 15% in two squares adjacent to the grinding stone, and some 20% in two squares adjacent to the south wall. Therefore, we can consider two

possible explanations for these concentrations, e.g., it served as a roofing material or for soap making (*ibid*). At any rate, the plant could have been used for more than one purpose. If indeed the site inhabitants consumed *S. palaestina/fruticosa* seeds, this could explain why it appears in food-related areas on both floors. The distribution of *S. marianum* with grass grains on both floors may indicate that the Ohalo II inhabitants treated the *S. marianum* achenes and cereal grains the same way.

The high concentration of *G. tricornutum* was found only in the cereal distribution area, and not in the north where the frequencies of cereal were low and other plants relatively high. The

Melilotus indicus

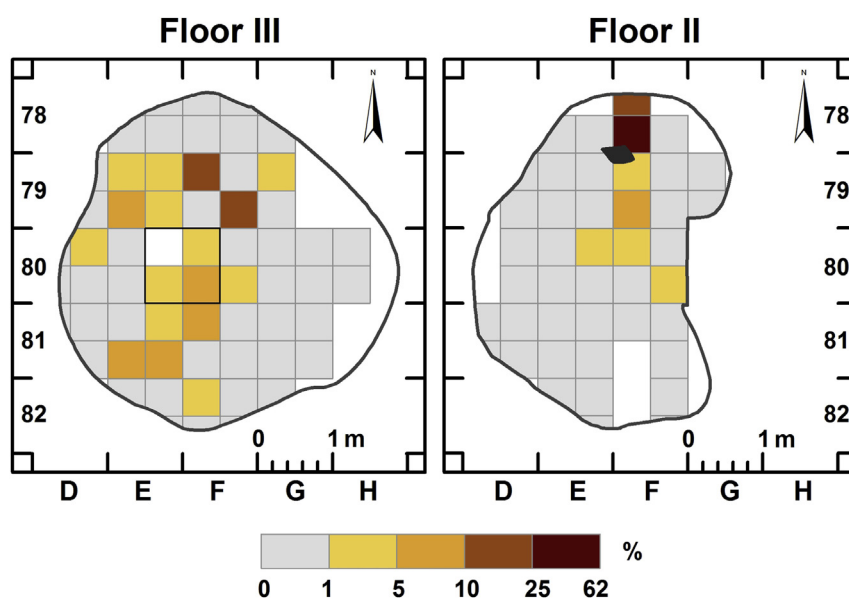


Fig. 15. Distribution of Indian melilot (*Melilotus indicus*) 147 seeds on Floor III and 110 seeds on Floor II.

Atriplex rosea / *leucoclada*

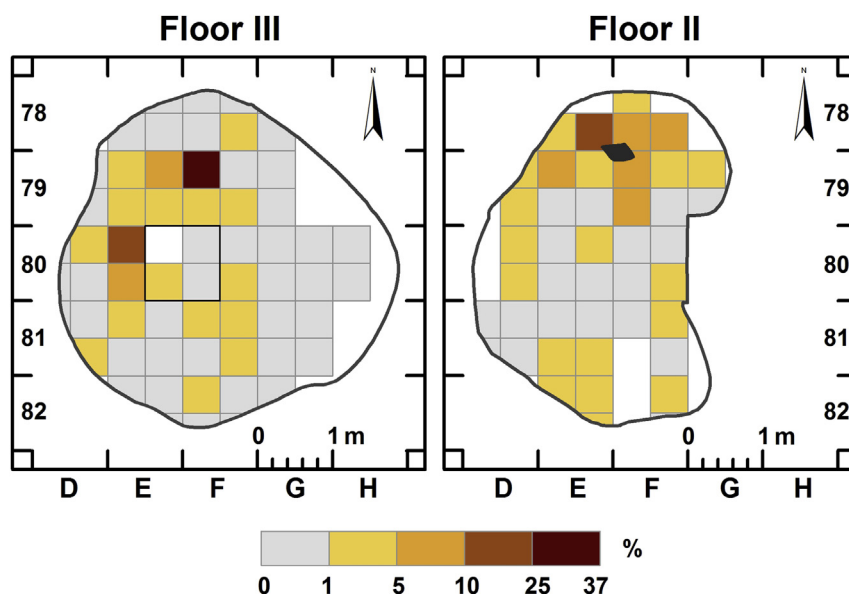


Fig. 16. Distribution of orache (*Atriplex rosea*/leucoclada) 463 fruits on Floor III and 1228 fruits on Floor II.

concentration of these plants in the same area may show that they grew together and were brought together into the hut.

Regarding the distributions of *P. cf. convoluta*, it seems that the plant was used differently on the two floors. On Floor III, the plants were collected probably in late summer-early winter and spread as a soft bedding material overlaying most of the floor (Nadel et al., 2004). Unlike Floor III, their distribution pattern on Floor II seems to reflect their use as wall/roof material. On Floor III, the grains were not distributed like the stems in a concentric or half-concentric order around the hearth (Fig. 3), but primarily to the west and north of the hearth. On Floor II the grain-distribution

units were found concentrated in very restricted areas and most of the floor space had no grains, or at least a very meager amount. In both floors, most excavated squares were devoid of *P. cf. convoluta* (38/65 in Floor III, and 24/44 in Floor II). It seems to us, therefore, the presence of *P. cf. convoluta* seeds on Floor II most probably were used both for food (as some were found adjacent to the grinding stone) as well as for wall/roofing material, while their presence on Floor III might indicated their dietary use.

Concerning preparation of cereal for consumption, it is interesting to note that while no fixed grinding stone was found on Floor III, there is evidence that cereal processing took place. The

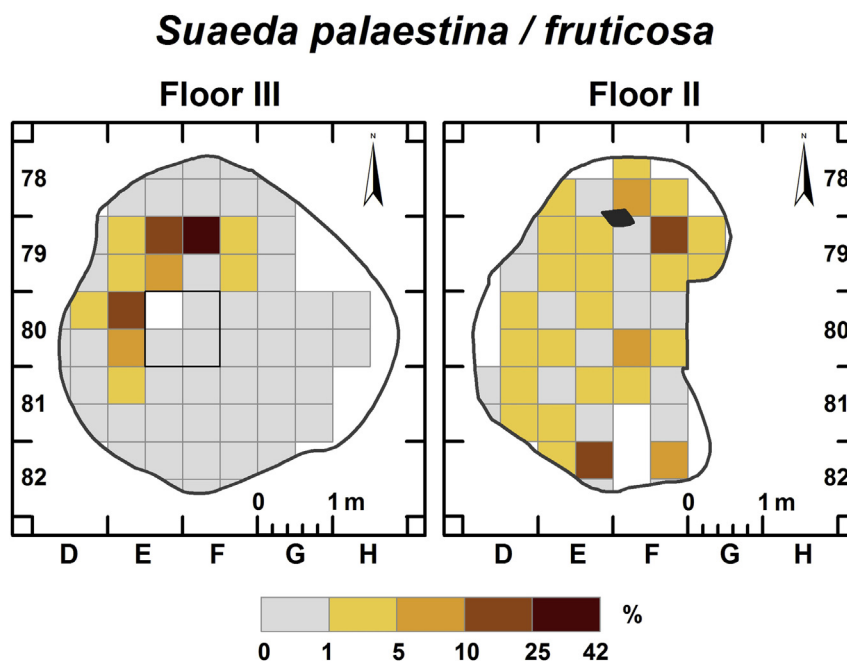


Fig. 17. Distribution of sea-blite (*Suaeda palaestina/fruticosa*) 22,505 seeds on Floor III and 31,034 seeds on Floor II.

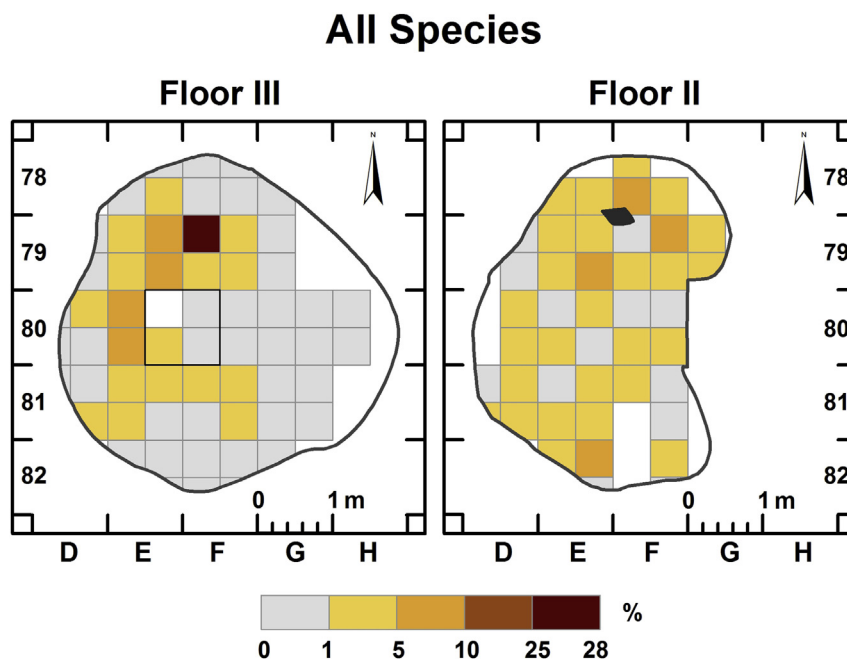


Fig. 18. Distribution of all the plants species that mapped, 45,606 seeds on Floor III and 52,323 seeds on Floor II.

concentration of broken “burgul” fractions in one square within the hearth indicates that the residents were preparing them as food, probably by beating them in a hand-held wooden or stone vessel or grind them on a grinding stone and later by exposing them to heat.

The remains found in Hut I indicate that the community living here was specialized in their food economy and residential habits. The two well-preserved floors allow a reconstruction of the lifestyle of the inhabitants. It seems that the people who rebuilt the burnt down hut of Floor III and formed Floor II belonged to the same community as the original occupants and undertook this task relatively soon after the original destruction. It is impossible to

determine whether the fire that burned down the huts was accidental (Mithen, 2003) or deliberate, e.g. to eliminate bugs. That assumption is predicated on the evidence that the second floor outline overlapped approximately where the first floor had been (Fig. 4), and that grass bedding covered both floors. In addition, the habitants of both floors consumed the same cereals with similar preparation technologies some 12,000 years before the Neolithic (Nadel et al., 2012).

Flowering time of the Israeli flora (as documented in various botanical literature) is based on plant collection from the varied geographical territories and districts in Israel. For this reason,

reported flowering dates are sometimes spread on more than one season. In the case of the two floors under discussion, we couldn't assign one specific season to each floor. However, the variation in the spatial patterns on these floors can be explained by the inhabitants' ability to modify their residence according to the season. The lowest floor includes two indicative features — a central hearth and grass bedding. The plant remains on this floor were organized into four groups that indicate separate food-preparation locations around the central hearth — in its north, west, and south (Fig. 6). We, therefore, suggest that this floor represents a hut inhabited in the winter, which required warmth as well as physical separation from the outside environment and the cold ground surface. One can easily picture people sitting on the bedding around the hearth for their daily activities. Floor II represents a hut that was built above the remains of the burnt down Floor III abode and has several modifications from Floor III. Here, no central hearth was built and there is no clear indication for grass bedding (though the grains of *P. cf. convoluta* might hint at its existence). On the contrary, a grinding stone used for cereal processing was fixed in the northern part of the floor. Here too plant food preparation activities were carried out in the northern part of the floor, around a grinding stone (Weiss et al., 2008). The difference in hut features — the lack of a central hearth and floor bedding, bring us to suggest that Floor II represent a hut used in the summer.

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